



# Asphalt Pavement Maintenance and Rehabilitation Strategies

## 2016 CAPTG Workshop: How to Assess and Extend the Service Life of Airfield Pavements

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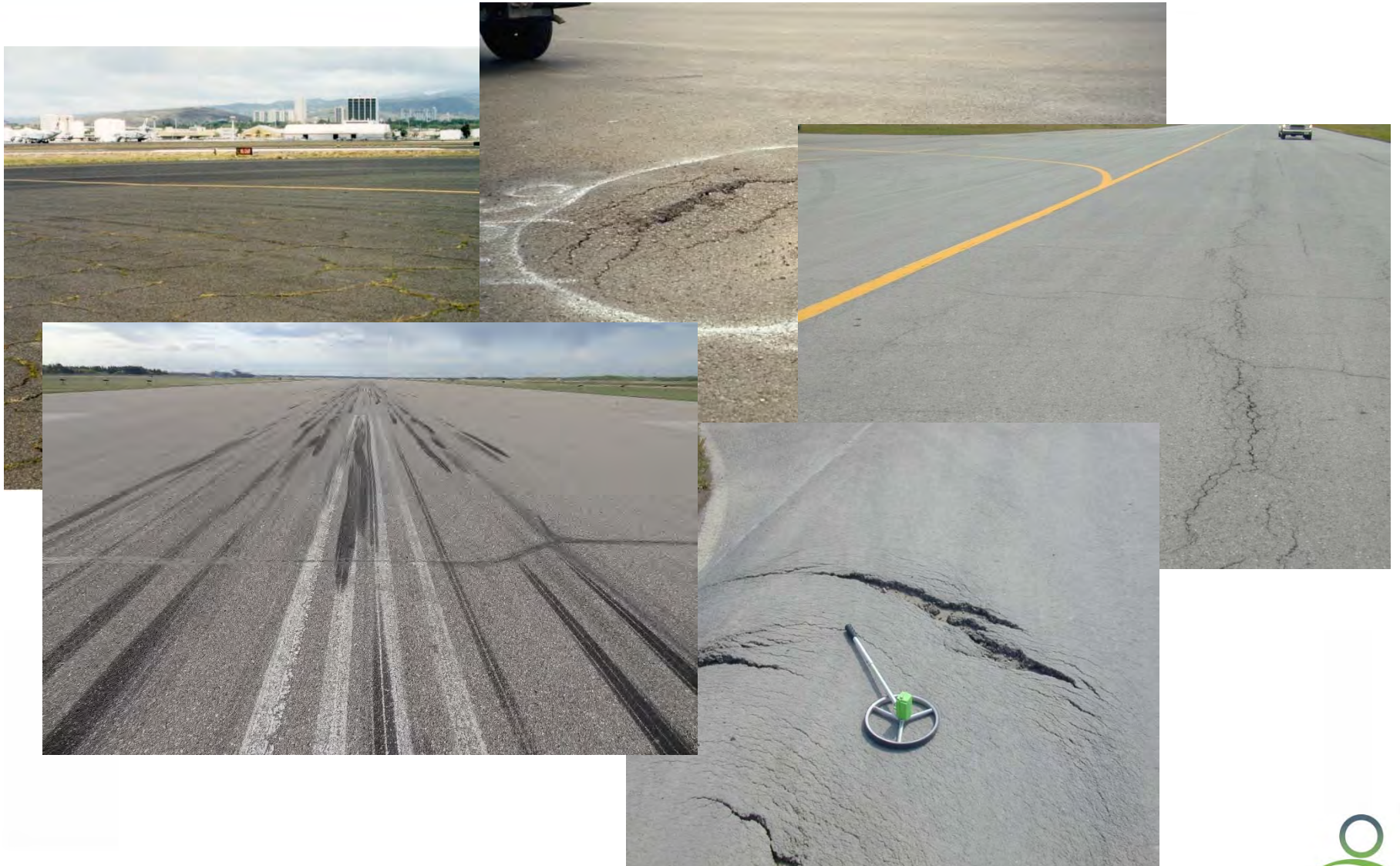
Presented by:

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Monday, September 19, 2016

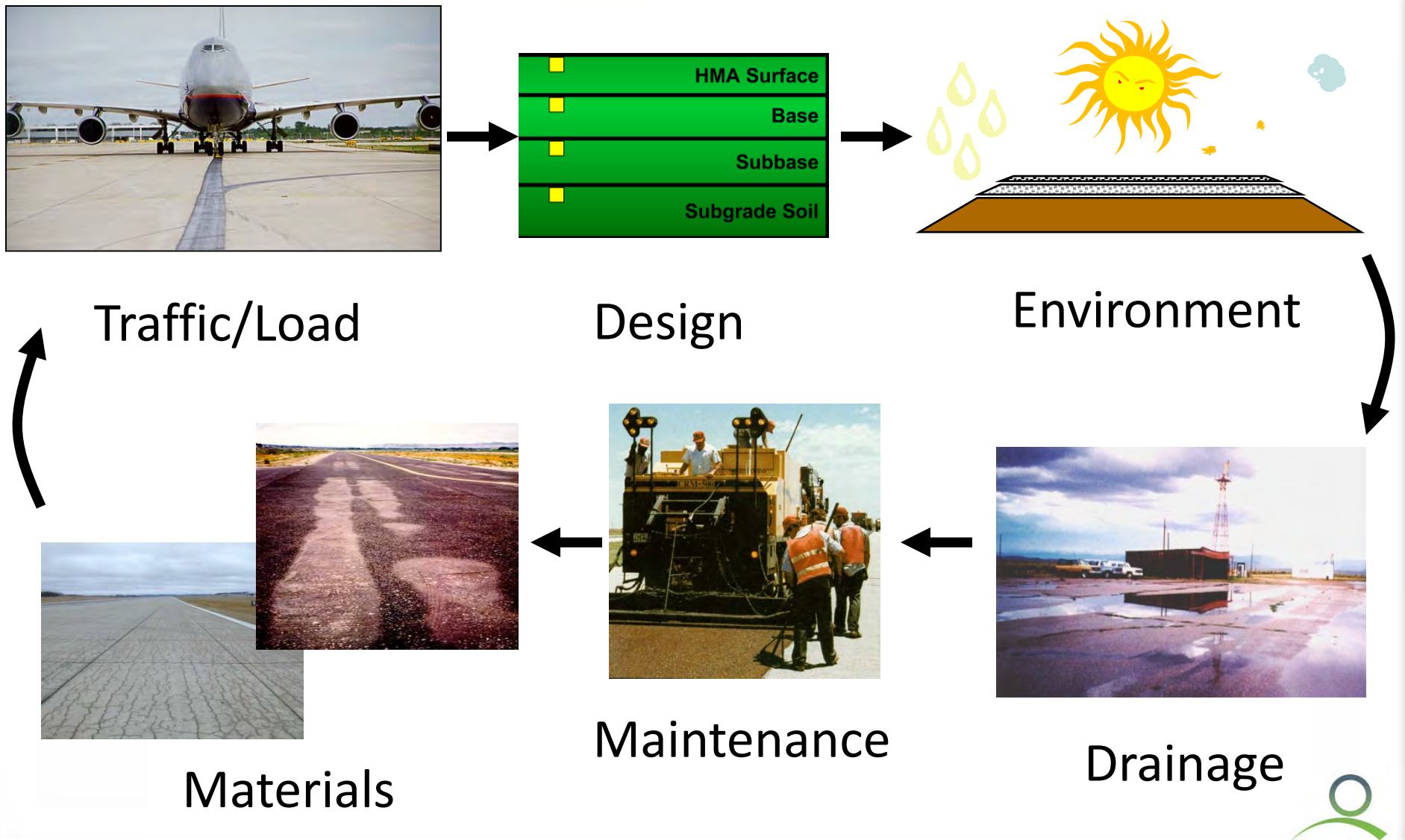


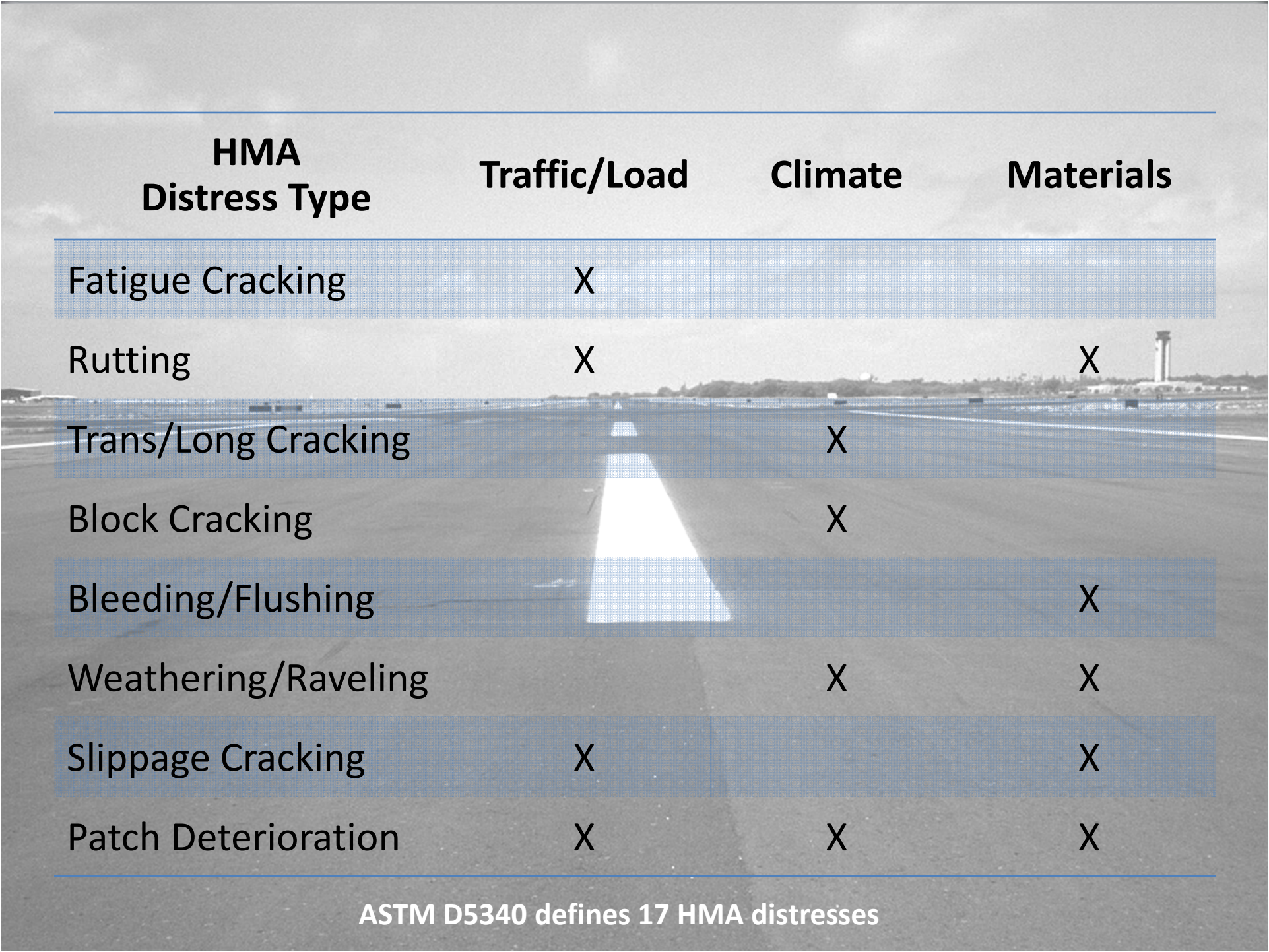
# Hot-Mix Asphalt Pavements





# Factors Affecting Performance





<b>HMA Distress Type</b>	<b>Traffic/Load</b>	<b>Climate</b>	<b>Materials</b>
Fatigue Cracking	X		
Rutting	X		X
Trans/Long Cracking		X	
Block Cracking		X	
Bleeding/Flushing			X
Weathering/Raveling		X	X
Slippage Cracking	X		X
Patch Deterioration	X	X	X

ASTM D5340 defines 17 HMA distresses

# Pavement Evaluation

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- Provides qualitative information to:
  - Determine causes of deterioration
  - Develop appropriate alternatives
- Provides quantitative information for:
  - Quantity estimates
  - Assessment of deterioration rates
  - Performing life-cycle cost analyses



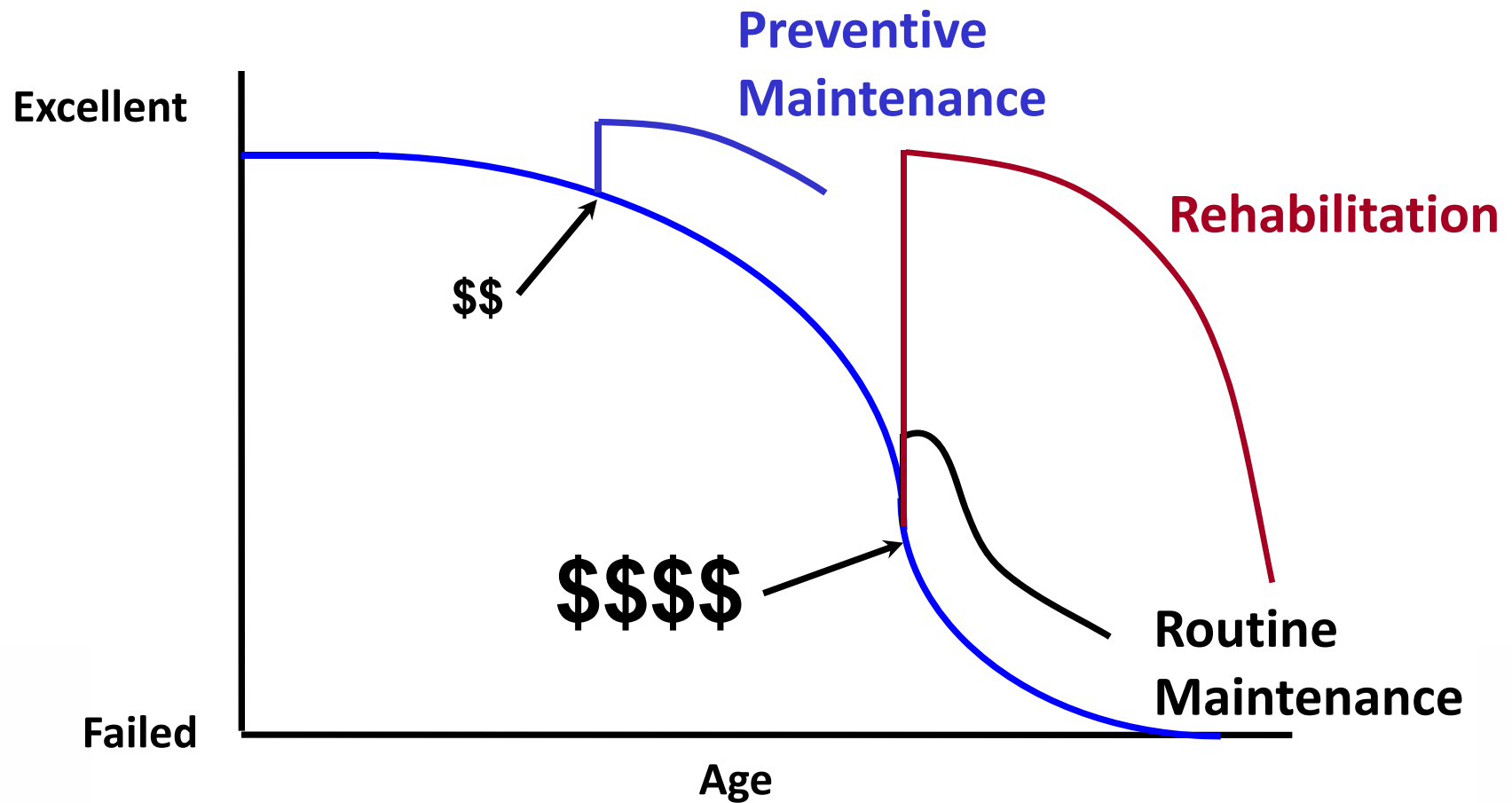


# Pavement Evaluation

- Goal: Fully characterize condition of pavement structure
  - Pavement distress inspections
  - Coring/boring and subsurface testing
  - Falling weight deflectometer (FWD) testing
  - Laboratory analysis of samples
  - Friction testing
  - Roughness testing



# Effects of Maintenance & Rehabilitation



# Strategies Considered

- Crack Sealing
- Surface Treatments
- HMA Patching
- HMA Overlays





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# **CRACK SEALING**



# Crack Sealing – Purpose

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- Reduce moisture infiltration to avoid:
  - Weakening base and subgrade layers
  - Stripping or delamination of HMA layers
- Reduce incompressibles filling cracks
- Provide support to adjacent pavement
- Prepare existing pavement for HMA overlay



# Crack Sealing – When is it effective?

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- Proper candidate pavements:
  - No extensive cracking
  - Little or no secondary cracking
  - Little or no raveling/spalling at crack face
  - Good base support
- Proper preparation and placement





# Would you crack seal this?

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# Would you crack seal this?





# Would you crack seal this?





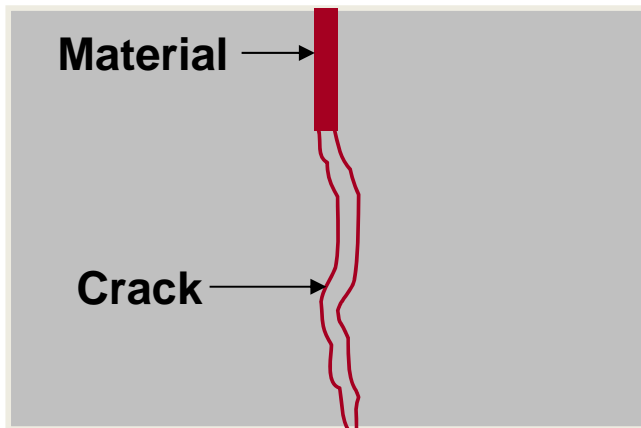
# Crack Sealing – Determining Needs

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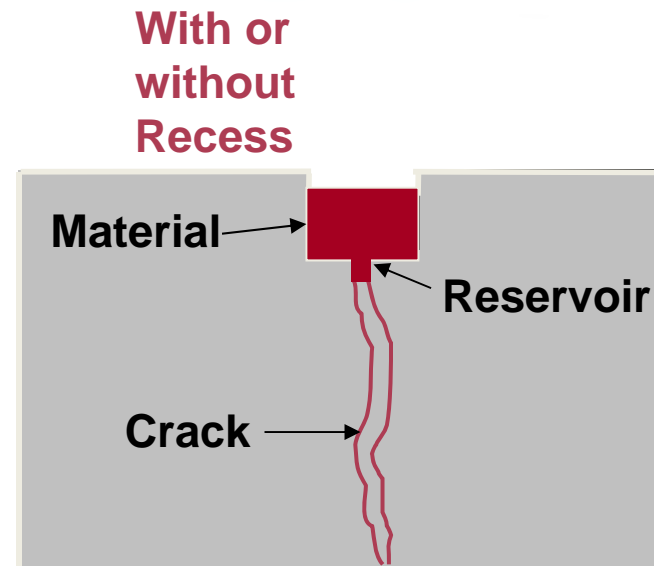
- Overall pavement condition
- Extent of cracking
- Type and width of crack
- Type of pavement
- Sealant material
- Placement configuration



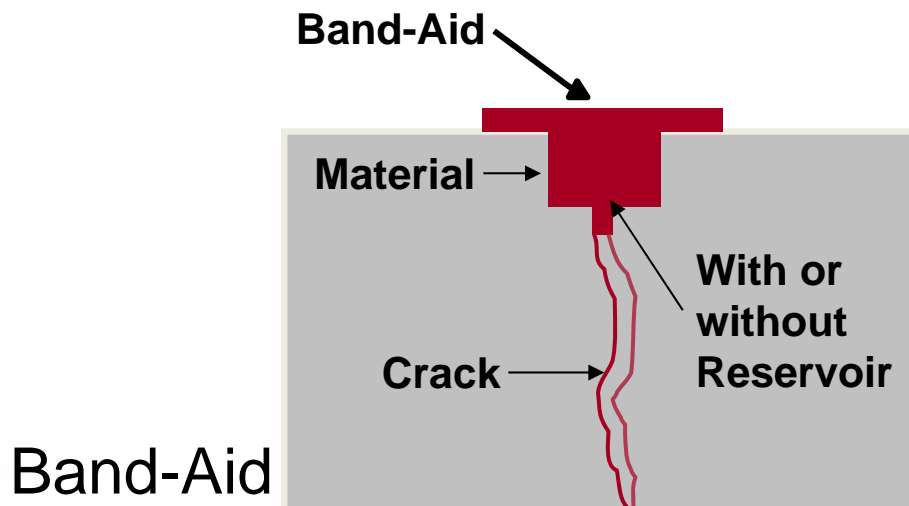
# Placement Configurations



Simple Flush Fill



Standard Reservoir



Band-Aid

Standard Reservoir and Band-Aid can have an optional backer rod



# Standard Reservoir Example





# Crack Sealing – Construction Considerations

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- Reservoir dimensions
- Clean
- Dry
- Adhesion
- No bubbles
- Final surface level or slightly recessed



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# **SURFACE TREATMENTS**



# Surface Treatments – Purpose

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- Slow aging process
- Waterproof surface
- Prevent stone loss
- Increase surface friction
- Improve surface appearance
- Do NOT improve structural capacity





# Surface Treatments – Types

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- Fog Seals
- Slurry Seals
- Microsurfacing
- Rejuvenators



# Surface Treatments – Fog Seals

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- Light application of diluted slow-setting asphalt emulsion
- Used to seal weathered/aged surfaces
- Treatment life: 2 to 4 years



# Surface Treatments – Slurry Seals

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- Mixture of fine aggregate, mineral filler, emulsified asphalt, and water
- Typically < 13 mm (0.5 in) thick
- Placed and cured fairly quickly
- Forms rigid wearing course
- Treatment life: 3 to 7 years





# Surface Treatments – Slurry Seals

- Benefits
  - Improve appearance
  - Weatherproof surface
  - Fill surface voids
  - Seal multiple, small non-working cracks
  - Increase friction



# Slurry Seals – When are they effective?

- No unstable rutting
- No fatigue cracking
- No severe bleeding
- Cracks with minimal movement



# Surface Treatments – Microsurfacing

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- Always polymer modified
- Chemically sets
- Can fill minor stable ruts
- Designed to be placed up to several stone thickness; can be placed in thicker layers than other surface treatments
- Can be applied in a broad range of temperature and weather conditions (i.e., at night and during extended construction seasons)
- Treatment life: 3 to 9 years





# Surface Treatments – Rejuvenators

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- Emulsions that include asphalt, polymer latex, and other additives
- Softens existing binder
- Example trade names:
  - Reclamite
  - PASS
  - Topien C
  - GSB-88



# Surface Treatments – Rejuvenators

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Pre-seal



Post-seal



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# HMA PATCHING





# HMA Patching – Purpose

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- Repair localized distress
- Reduce FOD potential
- Reduce roughness
- Extend the service life of the existing HMA
- Prepare existing pavement for an HMA overlay



# HMA Patching – When is it effective?

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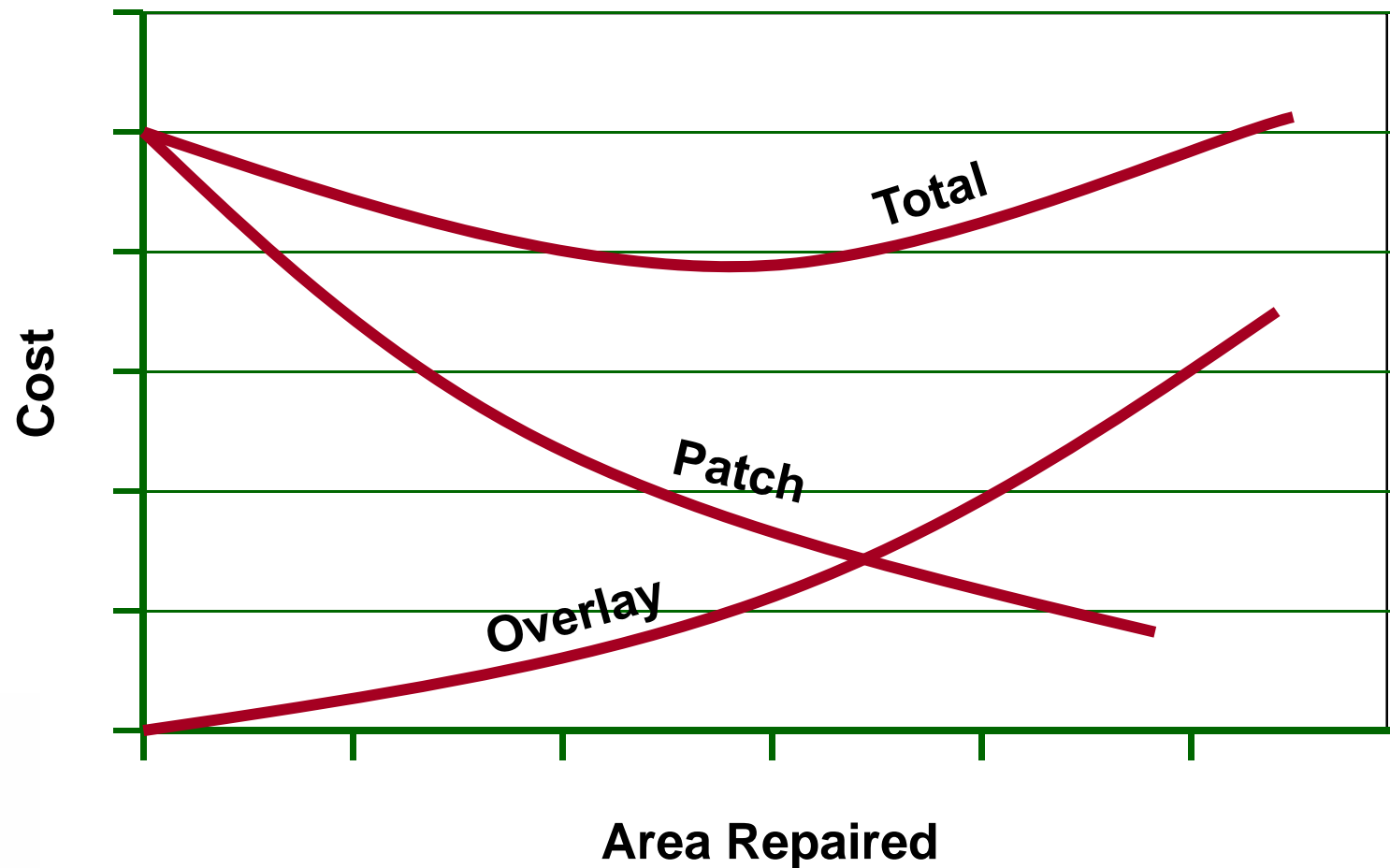
- Hot-mix, full-depth patches provide maximum effectiveness
- Not cost-effective when:
  - Pavement is extensively deteriorated
  - Structural design is not adequate
  - Principal problem is not corrected
- Temporary patches are temporary



# Would you patch this?



# HMA Patching – Cost Considerations





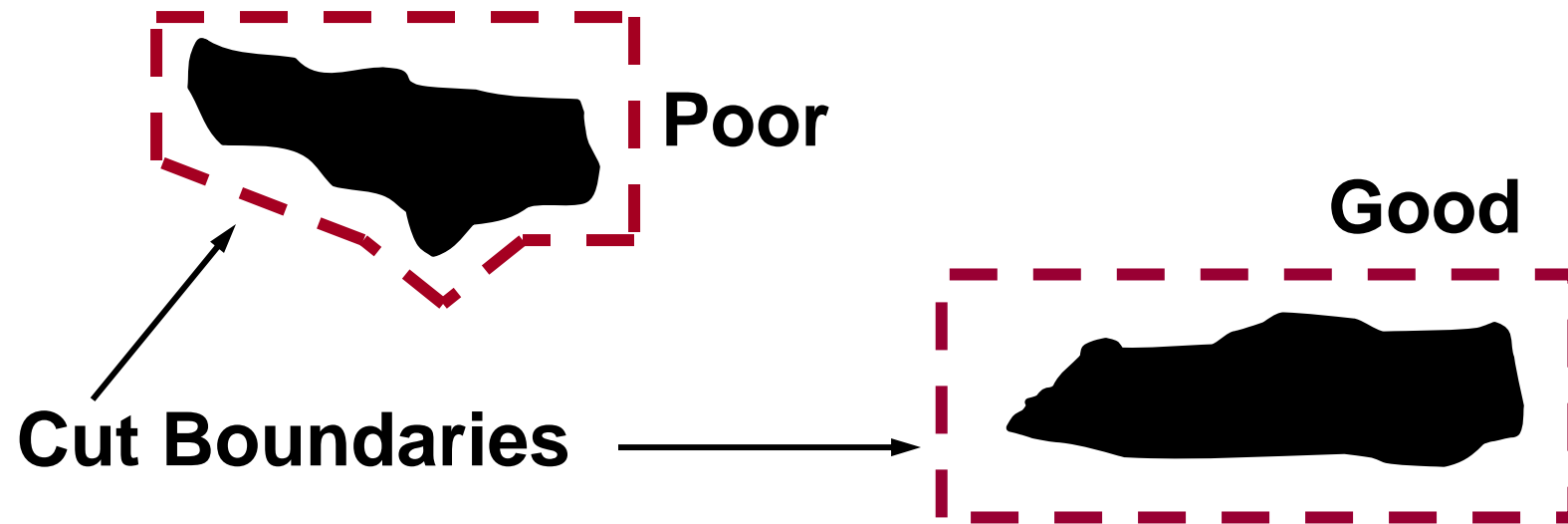
# HMA Patching – Construction Considerations

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- Mark patch boundaries
- Cut boundaries
- Clean and repair foundation
- Apply tack coat
- Fill the hole with high-quality HMA material
- Compact the patch
- Cleanup



# Mark Patch Boundaries



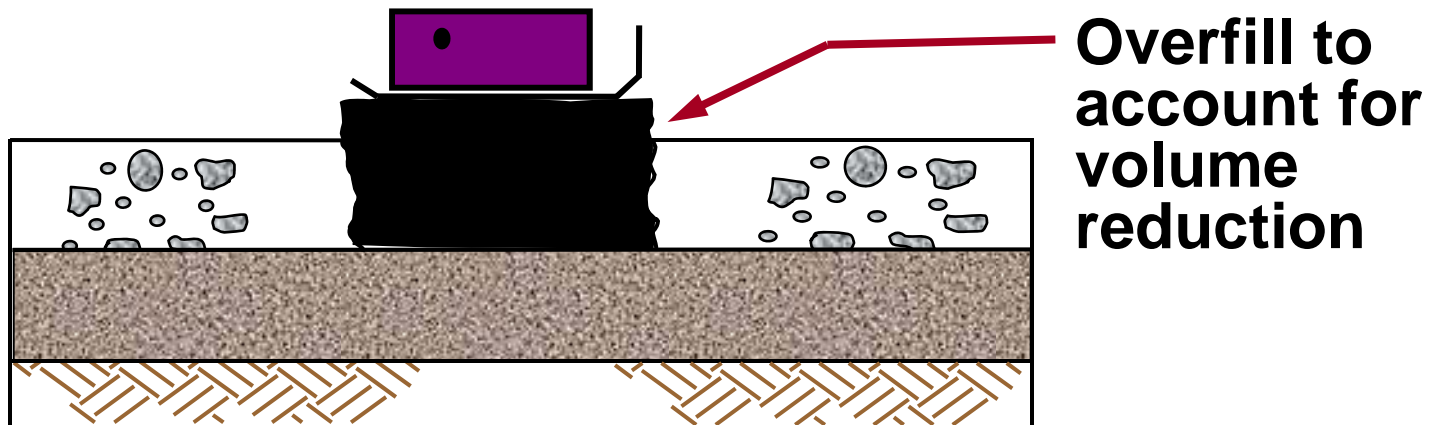
**Straight boundaries, recommended rectangular**

**Consider width of equipment**

**Adjacent area-sound pavement**



# Compacting the Patch



**Maximum lift thickness:  
~ 100 mm (4 inches)**



# Compaction Equipment





# Finished Patch

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# What is wrong here?



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# HMA OVERLAYS



# HMA Overlays

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- Most popular method of airfield pavement rehabilitation for all pavement types
- Relatively fast and cost-effective means for:
  - Correcting surface deficiencies and improving surface characteristics
  - Adding structural capacity
- Poor performance is NOT uncommon





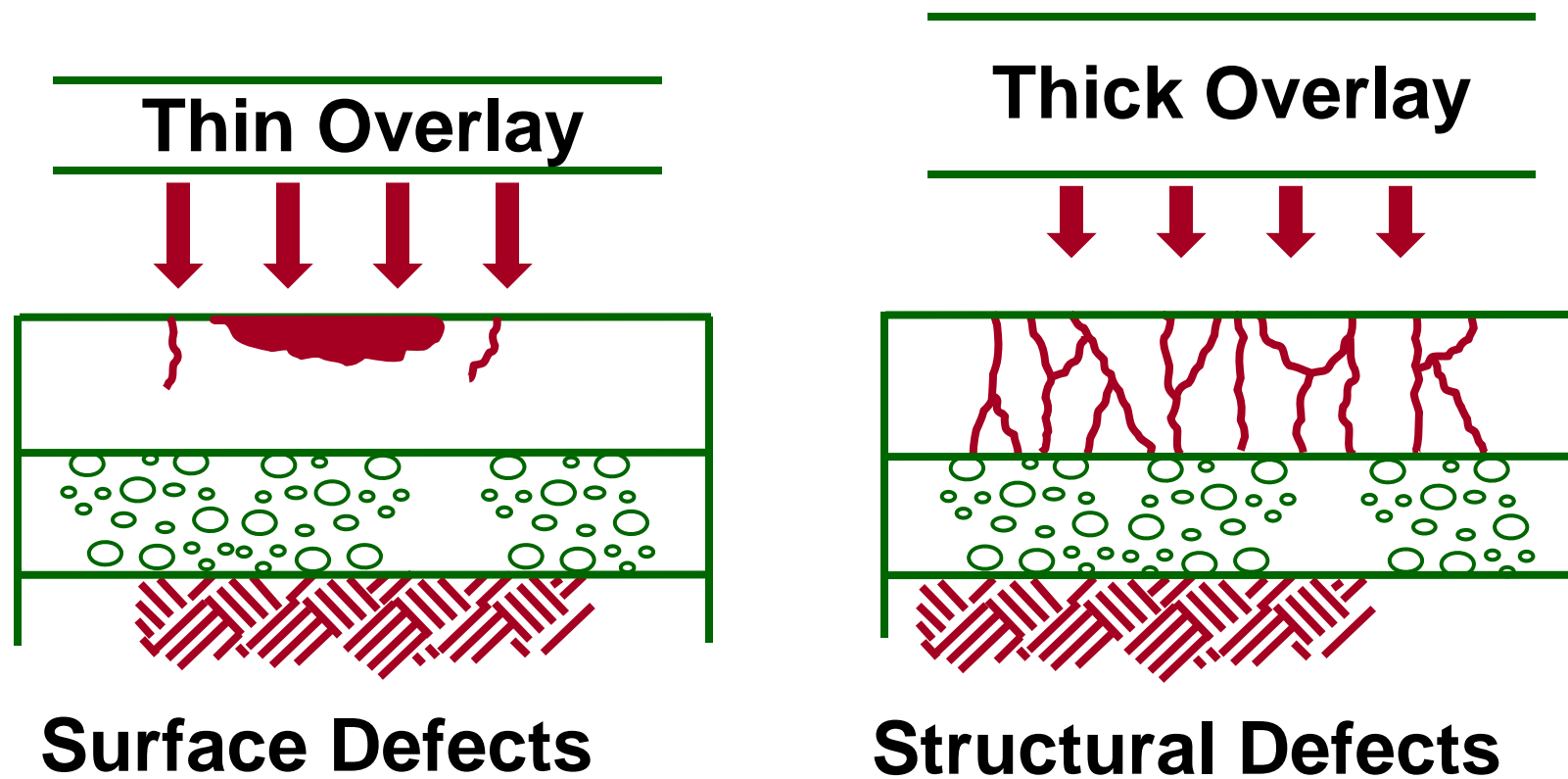
# HMA Overlays – Selection Considerations

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- Construction feasibility
  - Phasing needs
  - Utilities (lighting, drainage)
  - Grades and clearances
- Closure times
- Performance period
- Funding
- Loadings
- Drainage and environment



# HMA Overlays – Thickness Considerations



# HMA Overlays – Why do they fail?

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- Improper selection
- Wrong strategy
- Inadequate design
- Insufficient pre-overlay repair
- Poor materials and practices
- Poor longitudinal construction joints



# HMA Overlays – Supplemental Work

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- Localized pre-overlay repair
- Surface leveling (cold milling or leveling course)
  - Fill/level stable rutting
  - Restore cross slope
  - Improve longitudinal profile
- Drainage improvements
- Reflection crack control





# HMA Overlays – Reflection Crack Control

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- Pre-overlay repairs
- Sawing and sealing joints
- Increased overlay thickness
- Fabrics
- Stress-absorbing interlayers



# HMA Overlays – Sawing and Sealing

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- Objective: control rate of deterioration
- Reduces spalling of reflection cracks
- Candidates should have well-defined joints
- Sawcut must be directly above underlying joint



# HMA Overlays – Sawing and Sealing



# HMA Overlays – Increased Thickness

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- Delays the occurrence of reflection cracking
- Cracks propagate about 25 mm (1 inch) per year
- Reduces temperature fluctuations in underlying pavement







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**QUESTIONS?**

